



FY 2004 President's Request

Climate Change Research Initiative

Global Ocean Observing System

Addresses

NOAA Mission Goal #2

Understand
climate variability
and change to
enhance society's
ability to plan and
respond

What is requested?

NOAA requests an increase of \$6.3M as part of the \$13.4M increase in the Climate Observations and Services line item to continue building a global ocean observing system that accurately documents climate-scale changes in ocean heat, carbon, and sea level. The work, part of the Climate Change Research Initiative (CCRI), responds to the long-term requirements of NOAA's forecast centers and the agency's contributions to international research programs and major scientific assessments. The CCRI promotes the effective use of scientific knowledge in policy and management decisions. The proposed strategy is aligned with recommendations from the National Academy of Sciences June 2001 report entitled *Climate Change Science: An Analysis of Some Key Questions*. The increase is part of a multi-year phased implementation initiative.

Why do we need it?

The request will permit NOAA to increase our understanding and predictive capabilities of oceanic processes through monitoring and research, and allow us to provide sound scientific advice to those charged with managing the Nation's oceanic and atmospheric resources. The oceans are the main "memory" of the climate system and second only to the sun in affecting seasonal variability and long-term climate change. We need to continue efforts to determine whether circulation patterns are changing, as some models predict, and the potential impacts of climate events such as El Niño. We also need to map regional changes of vital interest to the health of the ocean. The ocean is both a source and sink for carbon dioxide and contains 50 times more carbon than the atmosphere. More advanced ocean observations are necessary to increase the accuracy of climate change forecasts and predict more immediate impacts such as changing sea level. In addition, the key to possible abrupt climate change may lie in deep ocean circulation. Accurate observations are needed for use in climate models, for determining the present rate of change in ocean structure, and for alerting us to any unforeseen changes in ocean circulation that have potential climate impacts.

The sustained ocean observing system for climate under construction is a composite of complementary networks that work together to provide a more complete picture of the oceans' role in climate than any one system could individually describe. Satellites measure global sea surface temperature, sea surface height, and surface winds from space, and *in-situ* sensors measure conditions such as salinity by directly sampling the water. The systems rely on each other. For example, the U.S. contribution to the Argo float array, a global network of floats that profile ocean temperature and salinity, cannot be achieved without the ships of opportunity and the dedicated ship support also included

Global Ocean Observing System At-a-Glance

What: \$6.3M increase
Why: Higher-quality data at finer resolutions are required to increase predictive capabilities of climate change impacts.

Office of Oceanic & Atmospheric Research, Climate Change Research Initiative



in this initiative. The Argo array also cannot do its work without global measurements supplied through the National Polar-orbiting Operational Environmental Satellite (NPOESS). The satellite altimeters, in turn, must be calibrated using a subset of the tide gauge data. Each component makes a contribution to the total picture.

What will we do?

The funding will be used to bring to completion approximately 48% of the ocean observing system currently under construction. We will take more detailed measurements that will allow the entire system to function more cohesively and fill in existing data measurement gaps. Better observations will allow for more accurate predictions and forecasts. More oceanic data, collected at finer resolutions, will allow us to document long-term trends in sea-level change, determine ocean carbon sources and sinks, measure oceanic heat uptake and release, and help lead to better models.

With its partners, NOAA will upgrade 10 tide gauge stations and install geographic position system (GPS) receivers at selected stations to document sea level changes and provide calibration points for satellite instruments. A global network of ocean reference stations will be established to document long-term ocean/atmosphere variability and provide validation points for climate forecast models.

The global surface drifting buoy array will be completed, adding 240 sensors in data sparse regions to measure sea surface temperature and currents. Wind, pressure, and precipitation measurement capabilities will be added to aid short-term forecasting as well as climate research, seasonal forecasting, and assessment of long-term trends. The global tropical moored buoy network will be expanded to provide ocean and atmospheric observations that will aid the understanding of oceanic heat uptake and release.

Dedicated ship support will be provided for deployment of the drifting and moored arrays. Ship support will also be used for a survey of the global oceans to measure carbon content and change. The ships of opportunity network consisting of volunteer vessels will be enhanced, concentrating on a subset of high accuracy lines to be frequently repeated and sampled at high resolution for systematic upper ocean and atmospheric measurements. Autonomous carbon dioxide sensors will be added to moored arrays and ships of opportunity to analyze seasonal variability in carbon exchange between the ocean and atmosphere. In addition, key locations in the ocean will be monitored for signs of possible abrupt climate change using the ships, moored and drifting arrays.

What are the benefits?

In order for society to anticipate and adapt to changes in the Earth's climate system, we must first collect and analyze evidence of long-term variability. Documenting and forecasting sea level changes are essential to making land-use decisions in coastal regions. Documenting the ocean's role in carbon storage and release will also help reduce uncertainties and assist decision makers in establishing policy for potential climate change impacts influencing sectors such as public health, agriculture, and energy. The improved ocean observing system will provide the U.S. and its international partners with critical information on the role of the ocean in climate variability and change.

For more
information:

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FY 2004 Proposed Climate Change Research Initiative Program Components:

- Global Ocean Observing System
- Carbon Cycle Atmospheric Observing System
- Aerosols
- Climate Change Science Program Office
- Climate Change Computing Initiative



Office of Oceanic and Atmospheric Research
Climate Research
Climate Change Research Initiative

NOAA Budget
FY 2004
Change

Global Ocean
Observing System
\$13.4M